

### **REMARKS**

Claims 1-11 are pending in this application.

Claim 1 has been amended to recite that the lower limit of the viscosity of the high viscosity solvent is 50 mPa·s. Support for this lower limit value can be found on page 16, line 33.

Claims 1, 2 and 4-6 have been amended to correct minor typographical errors.

New claim 11 finds support at page 16, first paragraph of the present specification.

No new matter has been added by way of the above-amendment.

### **I. Claim Objections**

Claims 4-6 are objected to for containing informalities.

The Examiner objects to claims 4-6 for each containing more than one period. Also, the Examiner objects to the use of parentheses in these claims.

In response, Applicants have amended claims 4-6 to remove the redundant periods and parentheses.

### **II. Issues Under 35 U.S.C. 112, Second Paragraph**

Claims 1-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Applicants respectfully traverse the rejection.

The Examiner objects to the following phrase in claim 1:

"a charge-transporting substance composed of a charge transporting monomer or a charge-transporting oligomer or polymer having a number average molecular weight of 200 to 500,000."

The Examiner alleges that it is unclear whether the number average molecular weight limitation is intended for the polymer material only, or for the monomer and oligomer materials as well.

In response, Applicants have amended claim 1 to clarify that the number average weight

limitation relates to the oligomer and polymer.

The Examiner objects to the following phrase in claim 2:

"wherein said charge transporting substance is a charge-transporting monomer having conjugated units or a charge transporting oligomer with a number average molecular weight of 200 to 5000 having conjugated units."

The Examiner alleges that it is unclear whether the molecular weight limitation is intended for the monomer or both the oligomer and monomer.

In response, Applicants have amended claim 2 to clarify that the molecular weight limitation relates to the oligomer.

In view of the fact that the claims, as amended, particularly point out and distinctly claim the subject matter which Applicant regards as the invention, the claims fully satisfy the requirements of 35 U.S.C. 112, second paragraph. As such, withdrawal of the rejection is respectfully requested.

### **III. Prior Art based issues**

The following prior art based Rejections are pending:

(A) Claims 1-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Kosho et al. (JP 2002-151272); and

(B) Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kosho et al. (JP 2002-151272) as applied to claim 1 above, and further in view of Ito et al. (5,993,694).

Applicants respectfully traverse both Rejection A and Rejection B.

### **Advantages of the present invention**

The present invention relates to a charge-transporting varnish and its products in the form of charge-transporting thin film, organic electroluminescence (abbreviated as organic EL hereinafter) element, and solar cell. The charge-transporting varnish according to the present invention provides a charge-transporting thin film which is flat and highly uniform. The charge-

transporting thin film formed on the electrode surface makes the electrode surface flat and homogenous, thereby preventing electric shortage.

Important to understanding the invention is that the varnish has a viscosity which readily changes as the ratio of solvents changes. The varnish is also applicable to various coating processes depending on the kind of solvents added. In other words, the charge-transporting varnish of the present invention can be made into a charge-transporting thin film by a simple inexpensive wet process, such as printing, ink-jet, and spraying.

The charge-transporting thin film can be used as the charge injection layer for the organic EL elements. The resulting organic EL element can be driven at a low voltage owing to reduction in injection barrier between the electrode and the organic layer. The flat electrode surface and the flat interface between the charge-transporting thin film and the organic layer contribute to the luminous efficiency and to life of the organic EL element.

Unlike the conventional charge-transporting varnish of aqueous solution type, the charge-transporting varnish of the present invention is in the form of solution in organic solvents, and hence it is resistant to moisture which is detrimental to the element.

The advantages of the present invention are readily ascertained from the data given in the present specification. For instance, the data from Table 2 at page 34 is reproduced (in part) below for the Examiner's convenience.

Table 2

	Film Thickness (nm)	Conductivity (S/cm) at 100 mA/cm <sup>2</sup>	Surface Roughness		
			Standard Deviation Rms (nm)	Average Roughness Ra (nm)	Maximum Height Rmax (nm)
Example 1 (made with c-HexOH, having a viscosity of 68 mPa·s at 20°C)	21	--	0.16	0.56	0.72
Example 1 (made with c-HexOH, having a viscosity of 68 mPa·s at 20°C)	66	--	0.09	0.31	0.45
Comparative Example 1 (made with DMF, having a viscosity <50 mPa·s at 20°C)	15	--	0.53	2.76	3.08

The Examiner will note that a varnish containing a low viscosity solvent as in Comparative Example 1 gave a film having a high surface roughness compared to a varnish

containing a high viscosity solvent as in Inventive Example 1 which gave a film having a very low surface roughness over a variety of film thicknesses.

These advantages of the present invention are neither taught nor suggested by the cited prior art.

Applicants now turn to the cited art.

Kosho et al. and Ito et al.

In order to further highlight the advantages of the present invention and to further distinguish from Kosho et al and Ito et al, Applicants have amended claim 1 to recite that the solvent contains at least one species of high-viscosity solvent having a viscosity of 50 to 200 mPa·s at 20°C. As noted above, films prepared from a varnish containing such a solvent are flat and highly uniform.

The Examiner asserts that Kosho et al. disclose that the material is dissolved in a solvent such as NMP, DMA, or DMF, which may be used as a mixture with ethylene glycol. However, as shown in "Viscosity" and "Ethylene Glycol Heat-Transfer Fluid" attached herewith, ethylene glycol has viscosities of 16.1 mPa·s at 25°C and 48 cp (= 48 mPa·s) at 4.4°C. Accordingly, the viscosity of ethylene glycol at 20°C is between 16.1 and 48 mPa·s. That is, Kosho et al. fail to disclose the inventive varnish comprising a high-viscosity solvent having a viscosity of 50 to 200 mPa·s at 20°C.

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Additionally, there must be a reason why one of ordinary skill in the art would modify the reference or combine reference teachings to obtain the invention *KSR Int'l Co. v Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007). Applicants respectfully submit that the presently claimed invention is not obvious over Kosho et al and Ito et al since there is no rational reason why an artisan would modify the solvents of Kosho et al and Ito et al to use the inventive high viscosity solvents.

Accordingly, those skilled in the art cannot foresee the inventive charge-transporting

varnish and the advantageous effect associated therewith from the disclosure of the cited references, and as such, withdrawal of the rejections is respectfully requested.

Conclusion

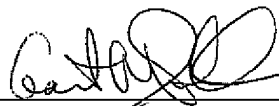
Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly solicited.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Gerald M. Murphy, Jr. (Reg. No. 28,977) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

By  #43575  
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Attachment:

- 1) "Viscosity" and
- 2) "Ethylene Glycol Heat-Transfer Fluid"